

Serial No.: 10/025,085
Filed: December 19, 2001

REMARKS

Election and Restrictions Requirement

Applicants concur the election of claims 1-10 and withdraw claims 11-20 for subsequent prosecution in a separate application. Applicants also affirm the election of the species of claims 1-5.

Amendments to Claims

Applicants amend claims 1, 2 and 6. Claim 6 is amended to forestall any rejection from Examiner in the event that claim 1 is allowed. In addition, claim 3 is cancelled.

Amendments to Figures

Applicants submit herewith a sheet of proposed corrections to Figure 5. Reference numeral 508 of Figure 5 is amended to redirect its indication to the conformal BARC lining the walls of the via. Support for the amendments to Figure 5 is found in the specification wherein is recited that "...or partially filled with photoresist 507 which is isolated from the low-K material by the conformal BARC 508 lining the walls of the via."

Rejections of Claims 1-5 under 35 USC § 112, second paragraph

The Examiner rejects claim 1 for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Examiner further rejects claims 2-5 for being dependent on claim 1.

Applicant submits that amended claims 1 and 2 overcome the §112 rejections. Specifically, claim 1 is amended to distinctly describe that the step of covering the walls of the aperture with a fill-in material is for isolating a portion of the insulation layer in the aperture

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from the photoresist layer. Furthermore, a sacrificial layer interfaces the photoresist layer and the insulation layer for further isolating one from the other. The amended claim 1 therefore no longer recite that the photoresist layer is isolated from the insulation layer. The amendments to claim 1 fully address the Examiner's §112, second paragraph concerns. The amendment to claim 2 was made to ensure continuity with respect to the amendments to claim 1. In accordance with the submitted amendments, reconsideration and withdrawal of the §112, second ¶, rejections are respectfully requested.

Rejections of Claims 1-4 under 35 USC § 102

The Examiner rejected claims 1-4 as being anticipated by Wang et al. (US 6,057,239) and Hussein et al. (US 6,329,118). Claim 1 has been amended to overcome the § 102 rejections. Specifically, the amended claim 1 recites that the fill-in material is chemically inert to the low-K dielectric material. Neither Wang nor Hussein discloses the need for the fill-in material to be chemically inert to the low-K dielectric material. Integrated circuit formation, or more specifically dual damascene patterning, is primarily a chemical reaction-based process. As identified in Applicant's specification, the problem of photoresist poisoning arises when low-K dielectric material is used as an insulating layer over the substrate. In solving this problem, the solution should not be restricted to a structural barrier between the insulating layer and the photoresist as described in both Wang and Hussein. Rather, amended claim 1 recites how both a structural and a chemical barrier are formable to substantially prevent photoresist poisoning when low-K dielectric material is used as an insulating layer over a substrate in a dual damascene

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process. Furthermore, new anti-reflective coatings are constantly being developed with varying material and chemical properties. Therefore, there is a possibility of using an anti-reflective coating that is chemically reactive with low-K dielectric coatings when working the invention of either Wang or Hussein. Consequently, the use of an anti-reflective coating that is chemically reactive with low-K dielectric coatings is methodologically disastrous when employed for isolating a low-K dielectric insulating layer from photoresist. As demonstrated, the possible consequence of working the invention of either Wang or Hussein runs affront to amended claim 1 of Applicant's invention. In addition, amended claim 1 recites the deposition of anti-reflective material onto the insulation layer for forming a sacrificial layer thereon. A typical sacrificial material is the anti-reflective coating described in both Wang and Hussein. The sacrificial material in Wang and Hussein for segregating the photoresist layer and the insulation layer is conveniently used for filling the aperture as well. On the contrary, amended claim 1 of Applicant's invention recites the use of different materials having different material properties for forming the sacrificial layer and for filling the aperture. For example, the anti-reflective coating employed as the sacrificial layer formed over the insulation layer must have good anti-reflection properties, and the fill-in material used for filling the aperture should have good flow properties to facilitate flow thereof into the aperture to thereby cover the walls of the aperture. Therefore, amended claim 1 enables the function of the sacrificial material to be decoupled from that of the fill-in material.

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From the foregoing explanation, it is apparent that Wang and Hussein do not anticipate nor render obvious amended claim 1. Thus, claim is allowable as is claims 2-4 at least for the same reasons as claim 1. Further, amended claim 2 recites the step of full filling the aperture in the step of filling the aperture of claim 1. Claim 3 recites the step of filling the aperture with antireflective coating in the step of full filling the aperture of amended claim 2. Claim 4 recites the step of filling the aperture with solvent-based fill-in material in the step of full filling the aperture of amended claim 2. The foregoing explains that each of amended claim 2 and claims 3-4 serves to narrow the scope of invention of claim 1. Therefore, as the amended claim 1 is not anticipated by Wang and Hussein, amended claim 2 and claims 3-4, being further restrictions on amended claim 1, are consequently not anticipated nor rendered obvious by Wang and Hussein. In accordance with the submitted amendments, reconsideration and withdrawal of the § 102 rejections are respectfully requested.

Rejection of Claim 5 under 35 USC § 103

The Examiner rejects claim 1 under 35 USC § 103(a) as being obvious over Ding et al. (US 5,981,145) in view of by Wang and Hussein. The subject matter in question is the use of water-soluble fill-in material for full filling the aperture. The Examiner contends that it would have been obvious at the time the invention was made to a person skilled in the art to combine the teachings of Ding to the process of Wang or Hussein to use the water soluble fill-in material to full fill the aperture.

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In the foregoing response to rejections of claim 5 under 35 USC § 102, claim 1 has been amended to overcome the rejections. In light of this, the invention of Applicant would not have been available, at the time the invention was made, to a person having ordinary skill in the art to combine with the light absorbing polymer of Ding. Amended claim 1 recites a method for creating a structural and chemical barrier, as abovementioned, between the photoresist and the low-K dielectric insulating layer. The fill-in material used in the invention of Applicant is recited in amended claim 1 as being chemically inert to the low-K dielectric materials. Many materials are chemically inert to low-K dielectric materials and can be chosen for use as fill-in material for the aperture when working Applicant's invention by a person skilled in the art. Therefore, specifically choosing an anti-reflective material for use as a fill-in material that is chemically inert to low-K dielectric materials is definitely not an obvious choice, let alone the possibility of choosing the light absorbing polymer described in Ding. The use of a solvent-based fill-in material is described in both Wang and Hussein. Therefore, both Wang and Hussein do not preclude the use of organic solvents or solvents with high toxicity. However, Examiner agrees that both Wang and Hussein are silent about full filling the aperture with a water soluble fill-in material. In the absence of specifically stating the use of a water soluble fill-in material, a person skilled in the art will be skilled to employ conventional fill-in materials or anti-reflective materials when working the invention of either Wang or Hussein. Therefore in the absence of claim 5 and without enlightenment from amended claim 1 of Applicant's invention, it would not be obvious at the time the invention was made to a person skilled in the art to combine the

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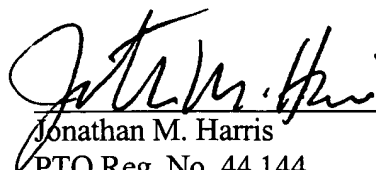
teachings of Ding to the process of Wang or Hussein to use the water soluble fill-in material to full fill the aperture. Furthermore, Claim 5 depends from claim 1. As explained above, claim 1 is neither anticipated by nor obvious over the art of record. Thus, claim 5 also is allowable. Therefore, in accordance with the submitted amendments and the above response, reconsideration and withdrawal of the rejections to claim 5 is respectfully requested.

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Conclusion

Applicants respectfully request reconsideration and allowance of the pending claims. If the Examiner feels that a telephone conference would expedite the resolution of this case, he is respectfully requested to contact the undersigned. In the course of the foregoing discussions, Applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art which have yet to be raised, but which may be raised in the future. If any fees or time extensions are inadvertently omitted or if any fees have been overpaid, please appropriately charge or credit those fees to Conley Rose, P.C. Deposit Account Number 03-2769/2085-00600/JMH and enter any time extension(s) necessary to prevent this case from being abandoned.

Respectfully submitted,



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